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From Real to Synthetic Data

Unlocking Industrial AI
by avoiding
the Black Box Trap

AXELERA ARTIFICIAL INTELLIGENCE
Syamak Nazary
Director Business Development

COMI
Markus Förste
CTO

D&E event

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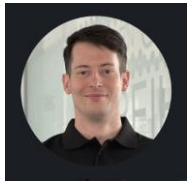
Who is who ?



Markus Förste
Head of AI

Syamak Nazary
Director Business Development

Patrick Pullens
BDM Embedded & AI

COMI

AXELERA ARTIFICIAL INTELLIGENCE

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COMI **Sofware**, models, & Axelera SDK

Your application SW

GenAI / LLM

AXELERA acceleration module

Edge AI embedded platform

Hardware x86 or ARM & Axelera accelerator

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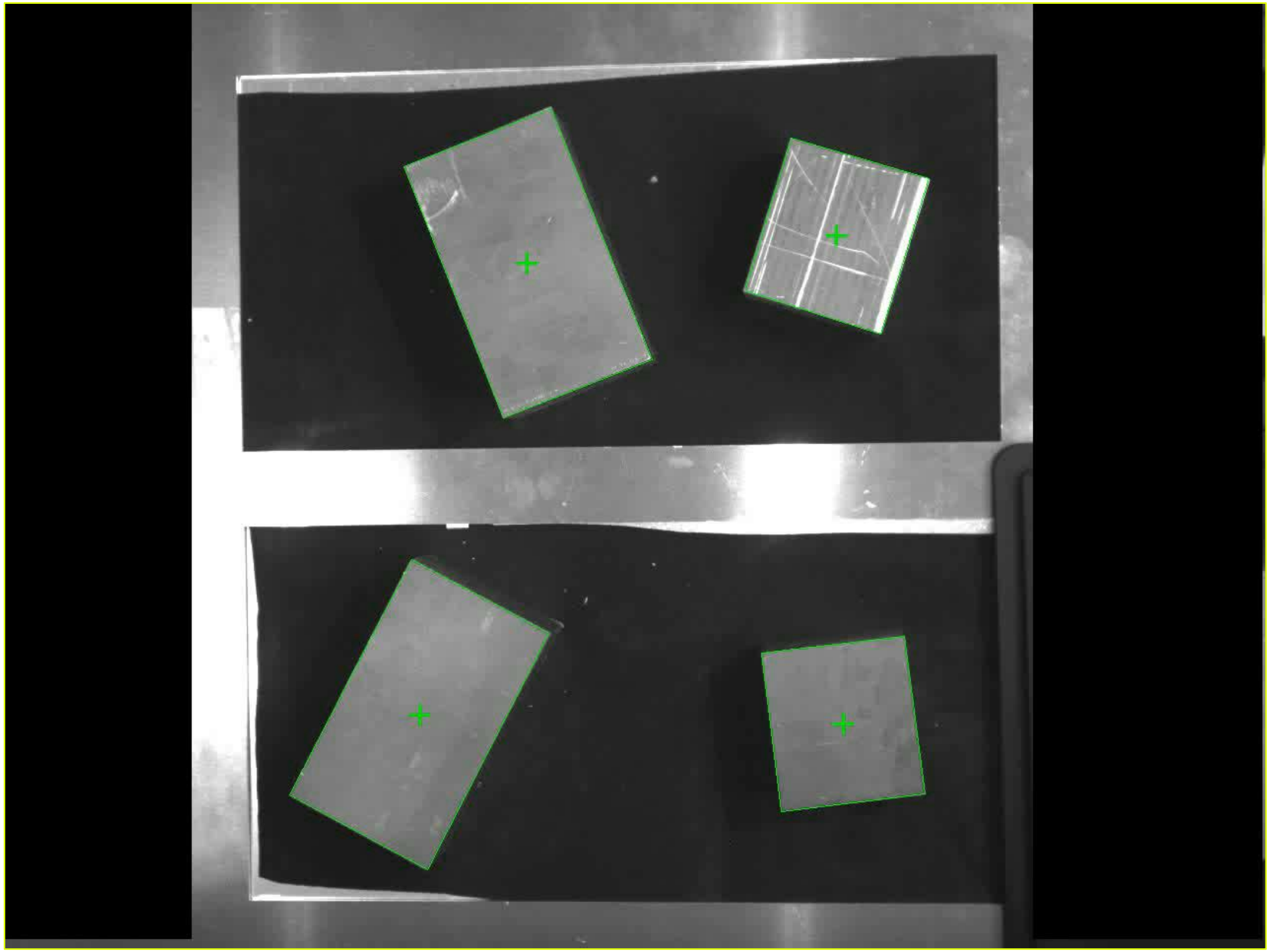
Why AI?



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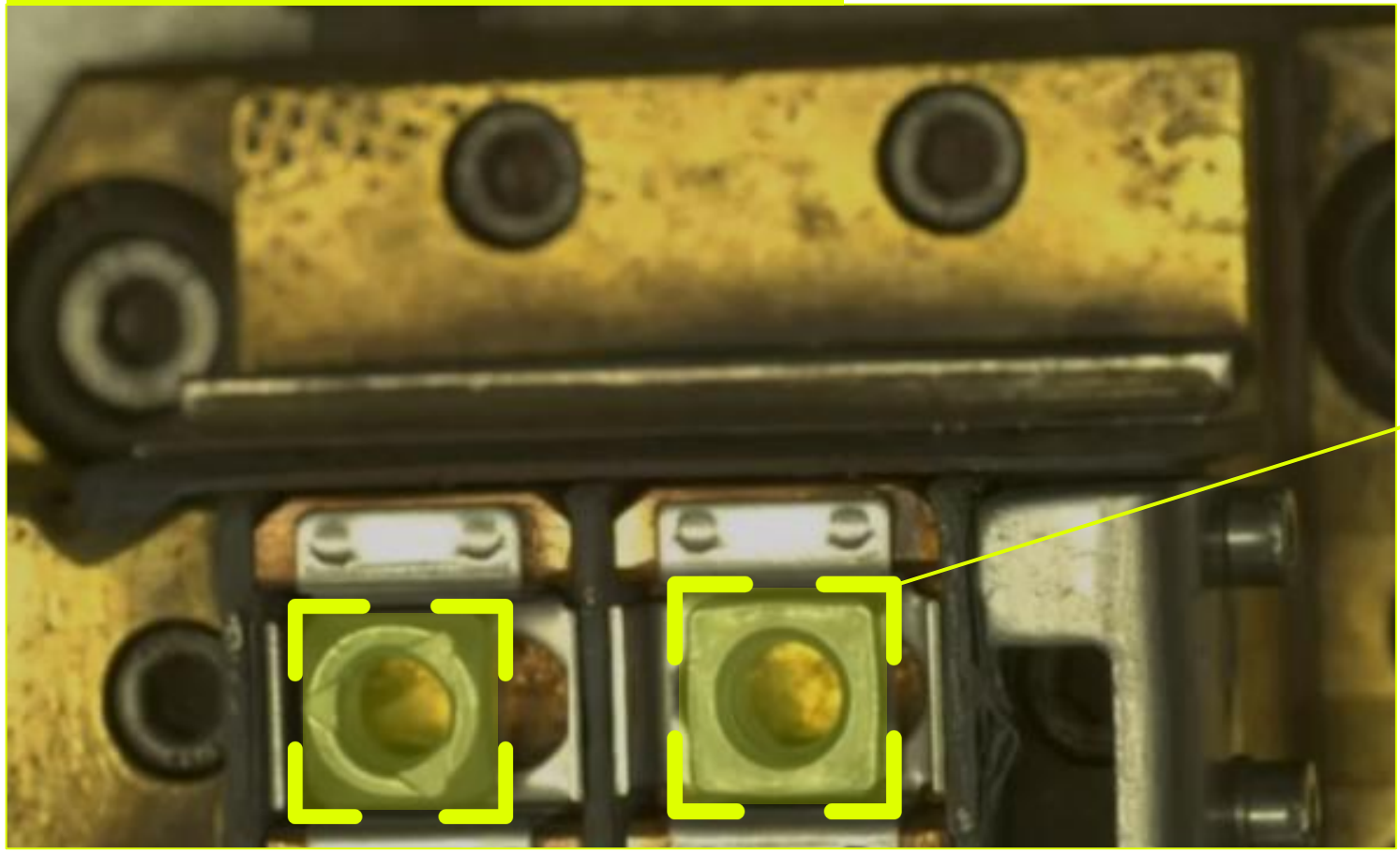
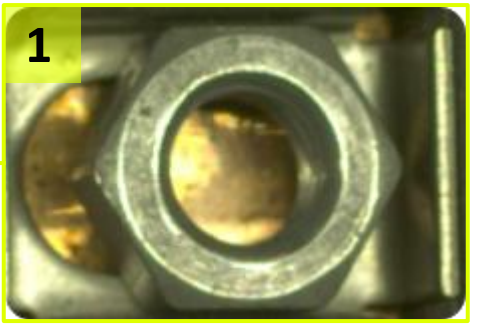
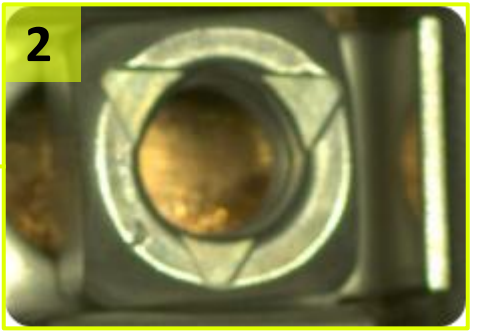
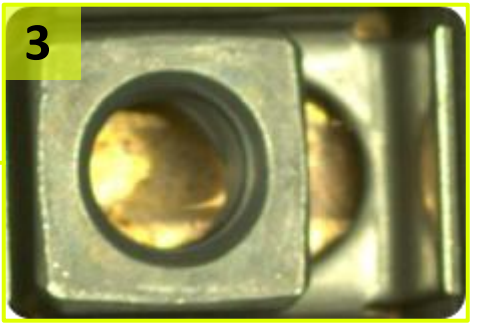
Example from Production

Classification / Checking in Manual Process









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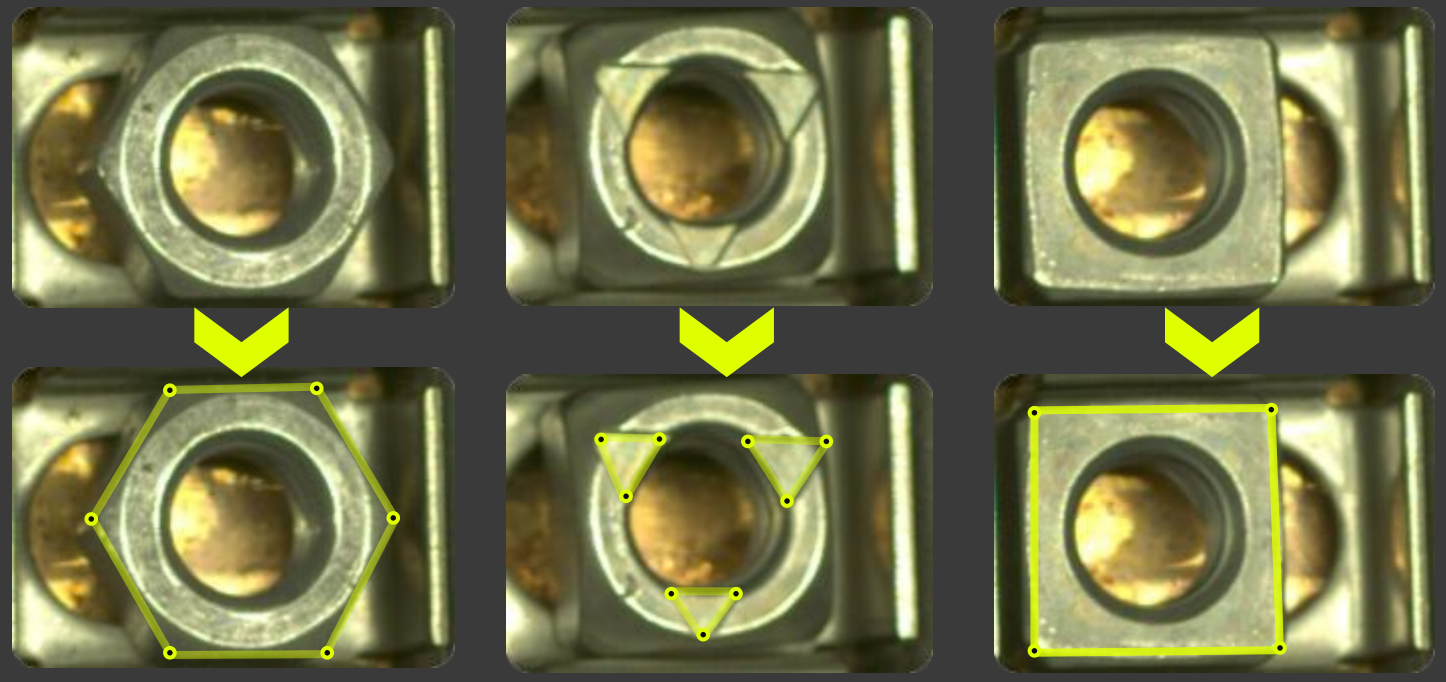
Classic Image Processing

Manual Process
Template Matching + Edge Detection



Limitations

Change of Lighting / Hardware

Dirt / Changes of Object

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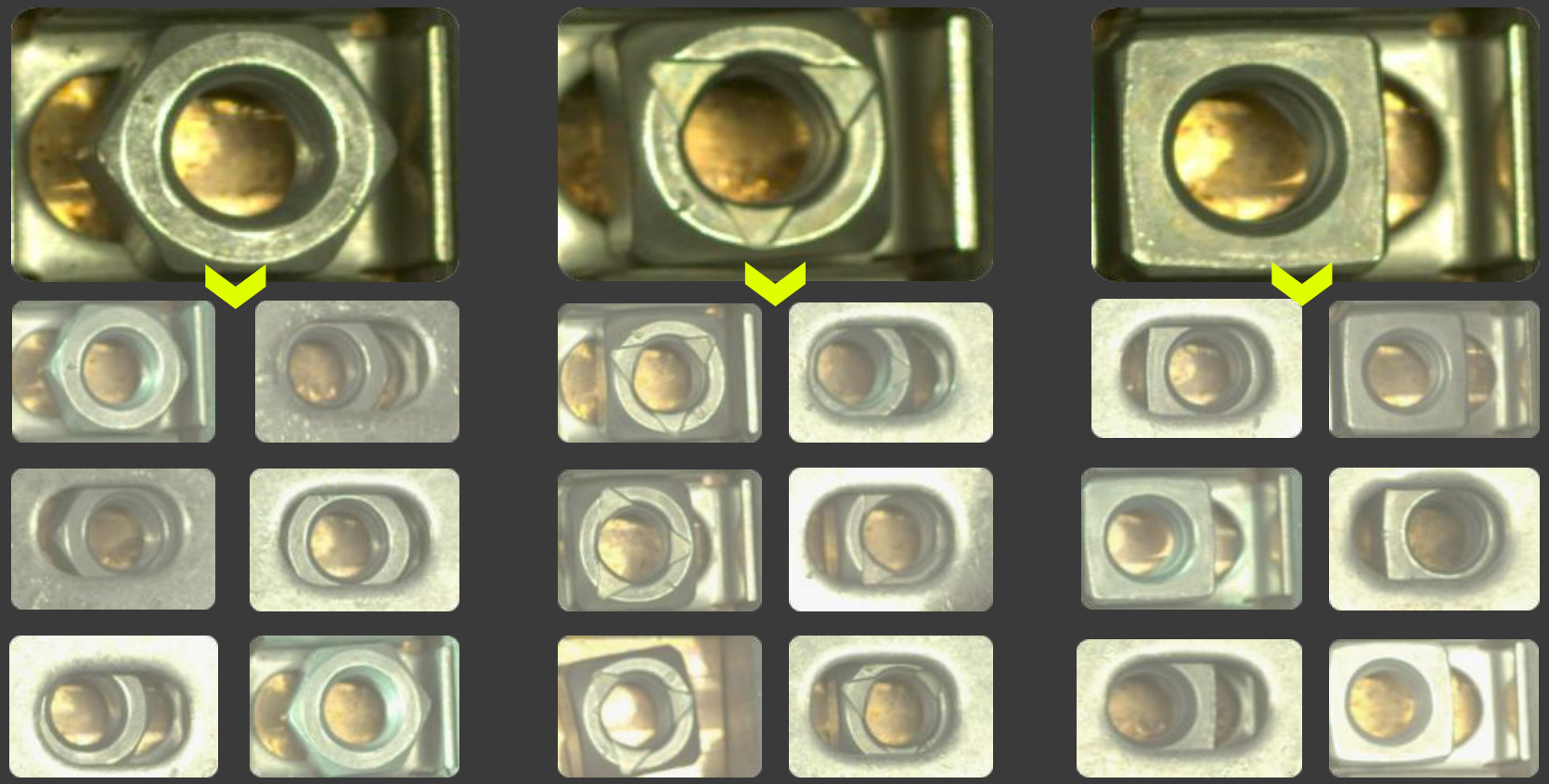
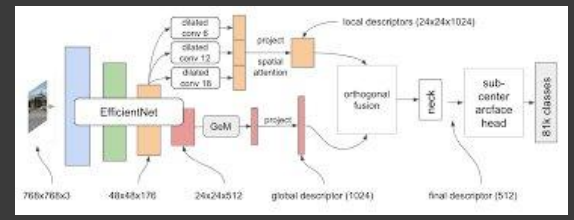
Classifications with AI – Model Training

1. Gather Training Data

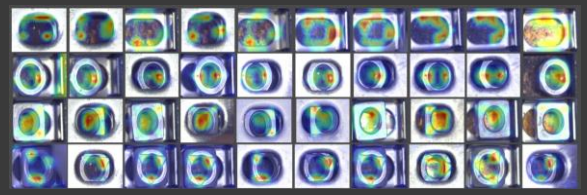


Training Data

2. Train Model



3. Evaluate Model



4. Deploy Model

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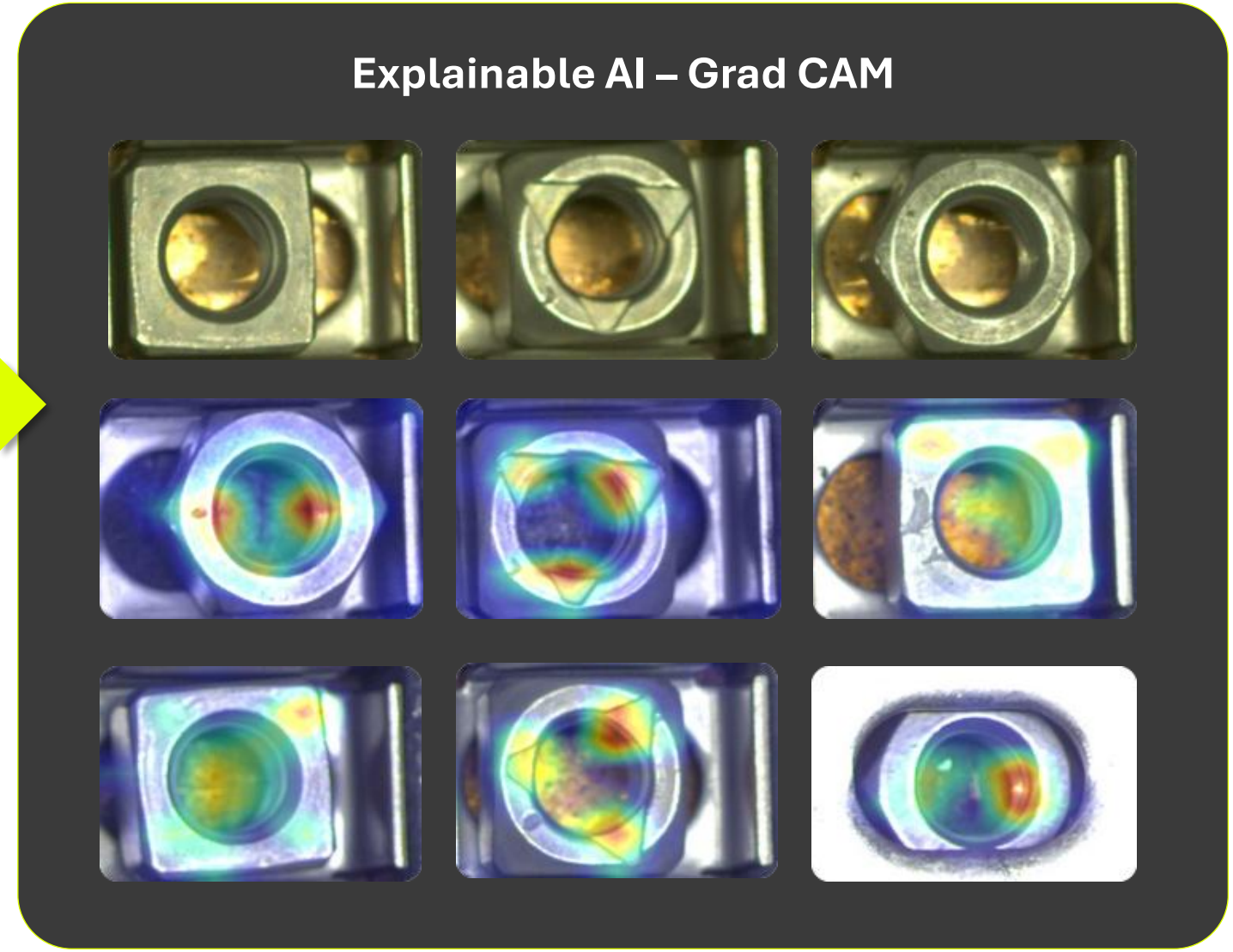
Classification with AI - Explainability

Is **AI** a **BLACKBOX**?



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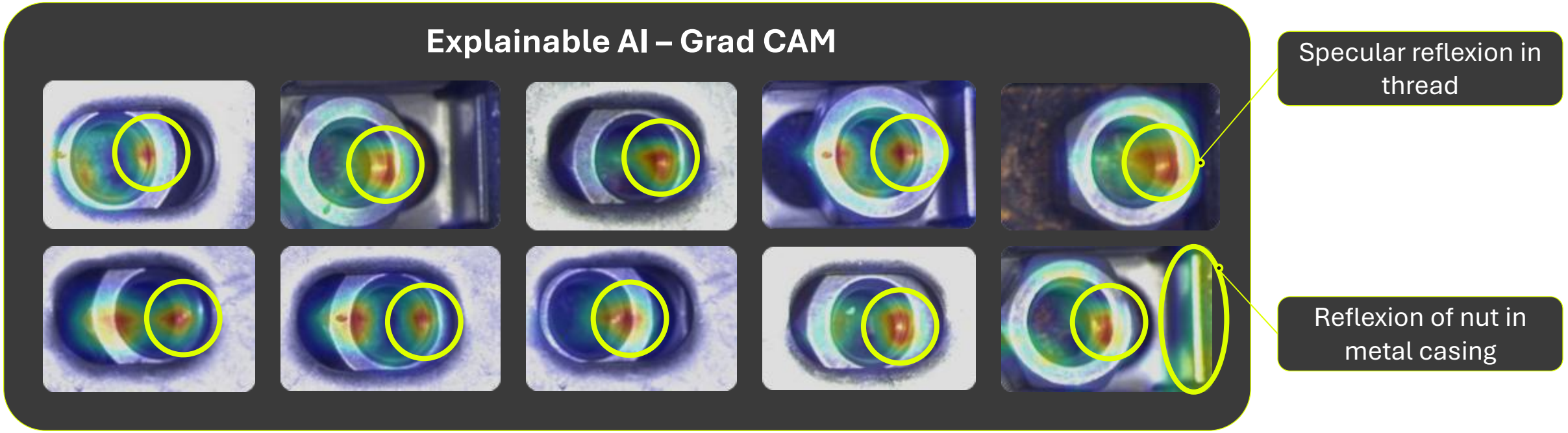
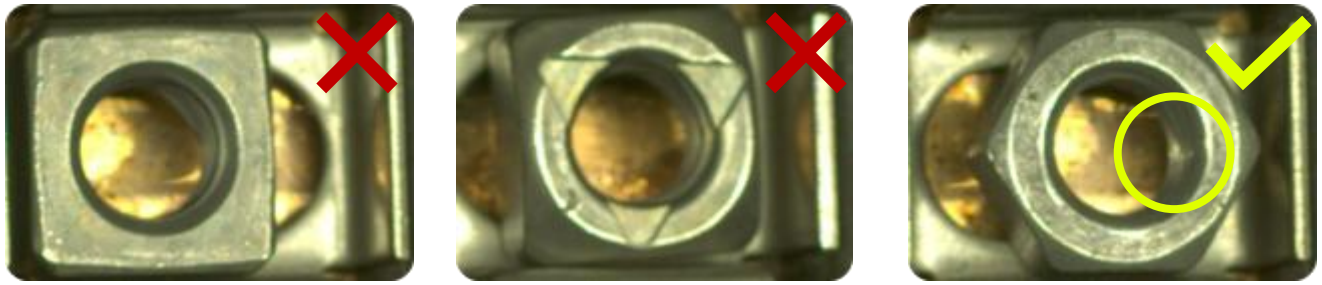
Classification with AI – Training Data





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Challenges of AI in Production

Data

- Not enough training data
- Objects not available
- Unclear camera setup
- Difficult or Changing conditions
- Dirt / Dust / Liquids

Experience

- Certification of AI based solutions

Connection to Customer

- Identifying problems
- Bridging gap between AI and domain experts

Hardware

- Getting sufficient hardware
- Performance / Reliability / Precision

Scaling

- Enabling customer to train model
- Scaling solutions

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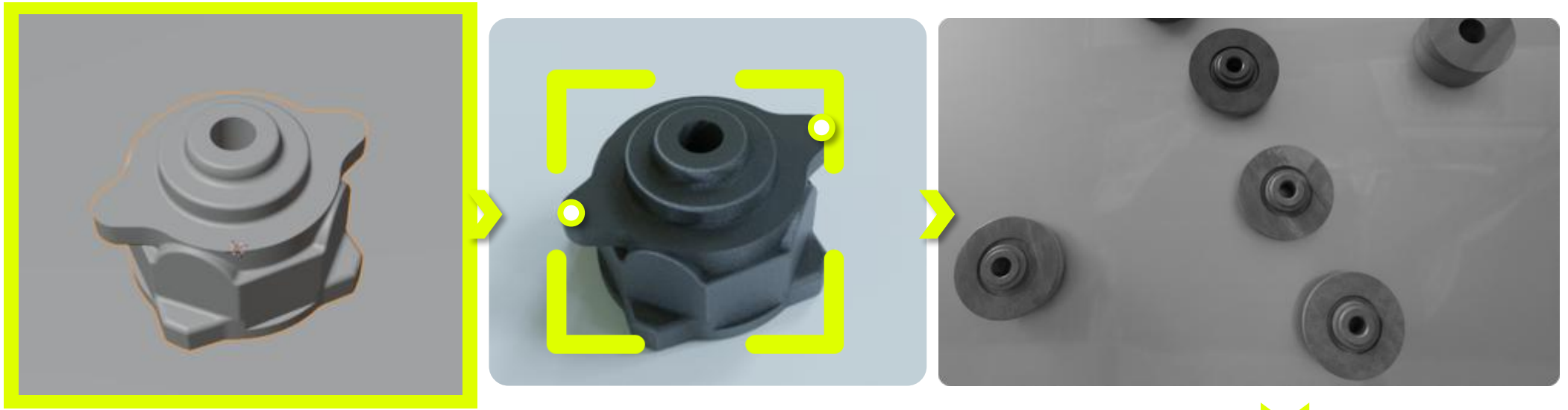
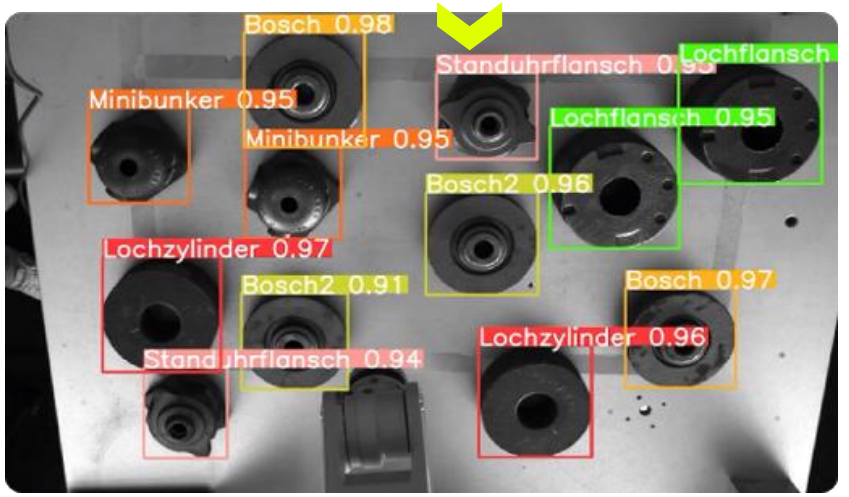
Synthetic Data



- Automated training through the generation of artificial training data from CADs
- Greater robustness against lighting conditions and contamination
- Automatic generation of extremely precise labels
- Significantly reduced effort for the customer when retraining additional workpieces



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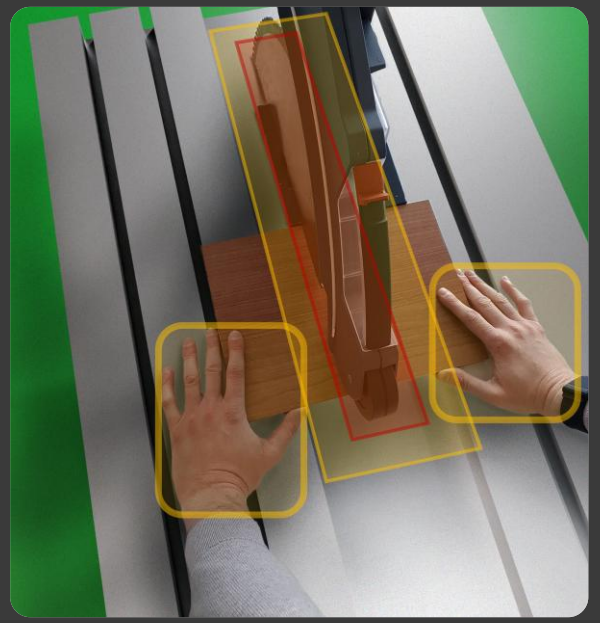
Types of AI – Getting the fitting hardware

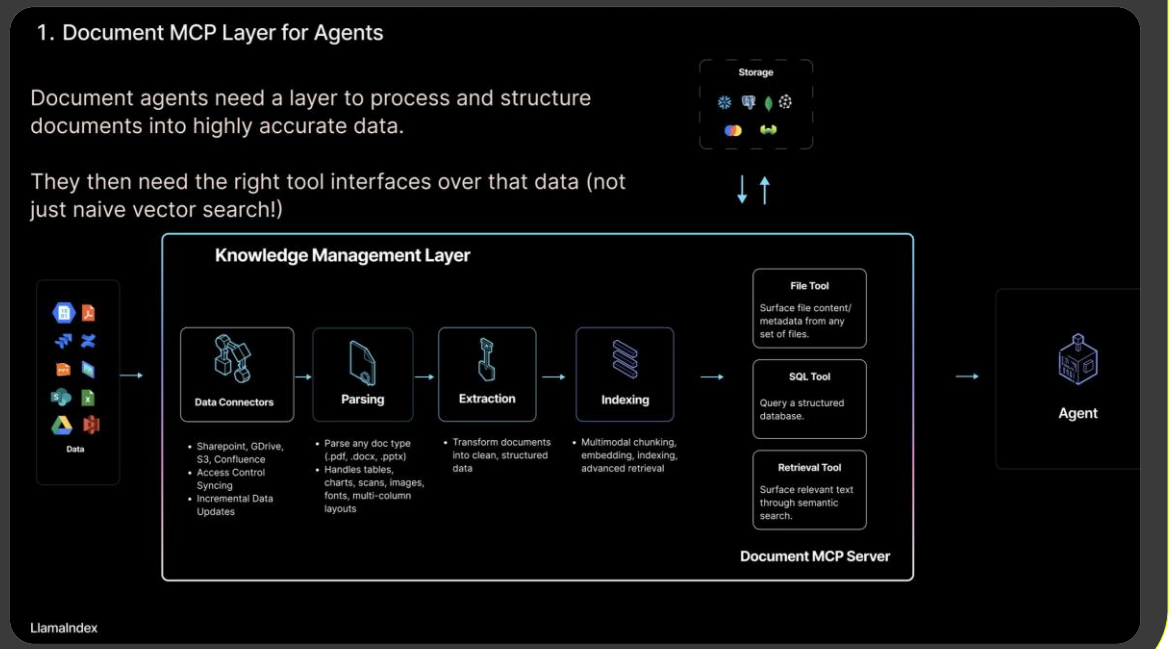
Vision Systems

For example:

- 3M Parameters
- RAM usage 1-2 GB



GenAI / LLMs



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System setup examples

High End / High speed / Full function AI platform / Multiple acceleration models use case

Main motherboard (supplied by Rutronik)

- Axelera Metis on **PCIe** interface card (supplied by Rutronik)
- Axelera SW tooling
- LLM software support from COMI

High Speed / Compact embedded Edge AI system / 'off the shelf' for Time To Market

Single Board Computer or BoxPC (supplied by Rutronik)

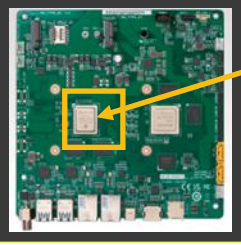
- Axelera Metis on **M.2** module (supplied by Rutronik)
- Axelera SW tooling
- LLM software support COMI

+

Dedicated chipdown / very compact / low power / cost down —- for high volume only

Dedicated ARM core design (chip down) guided by Rutronik

- Axelera Metis **chip**
- Axelera SW tooling
- LLM software support COMI



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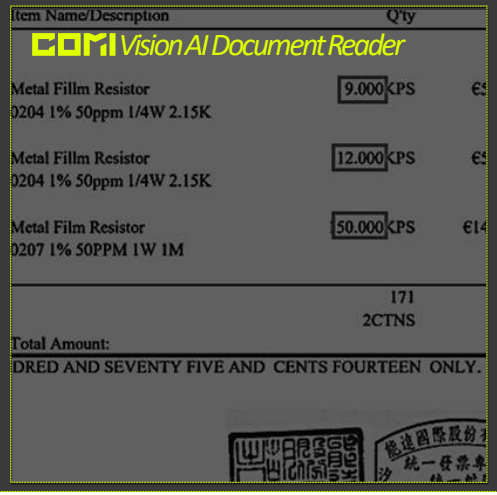
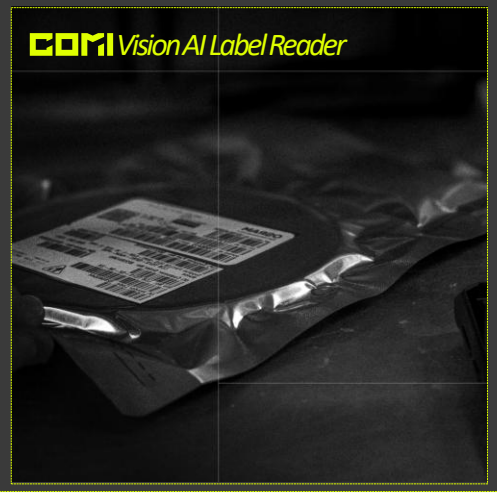
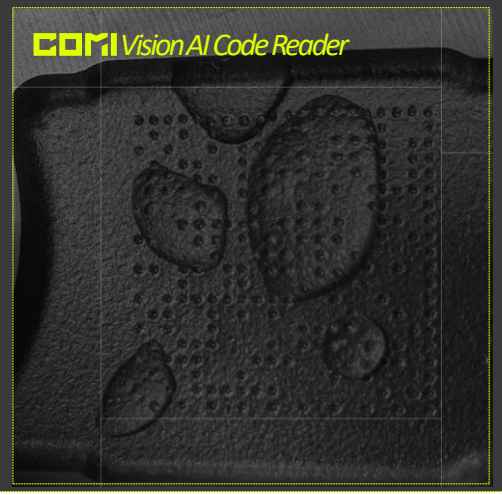
Vision AI Reader

Complete and intelligent recognition of documents, labels, and codes.







D&E event

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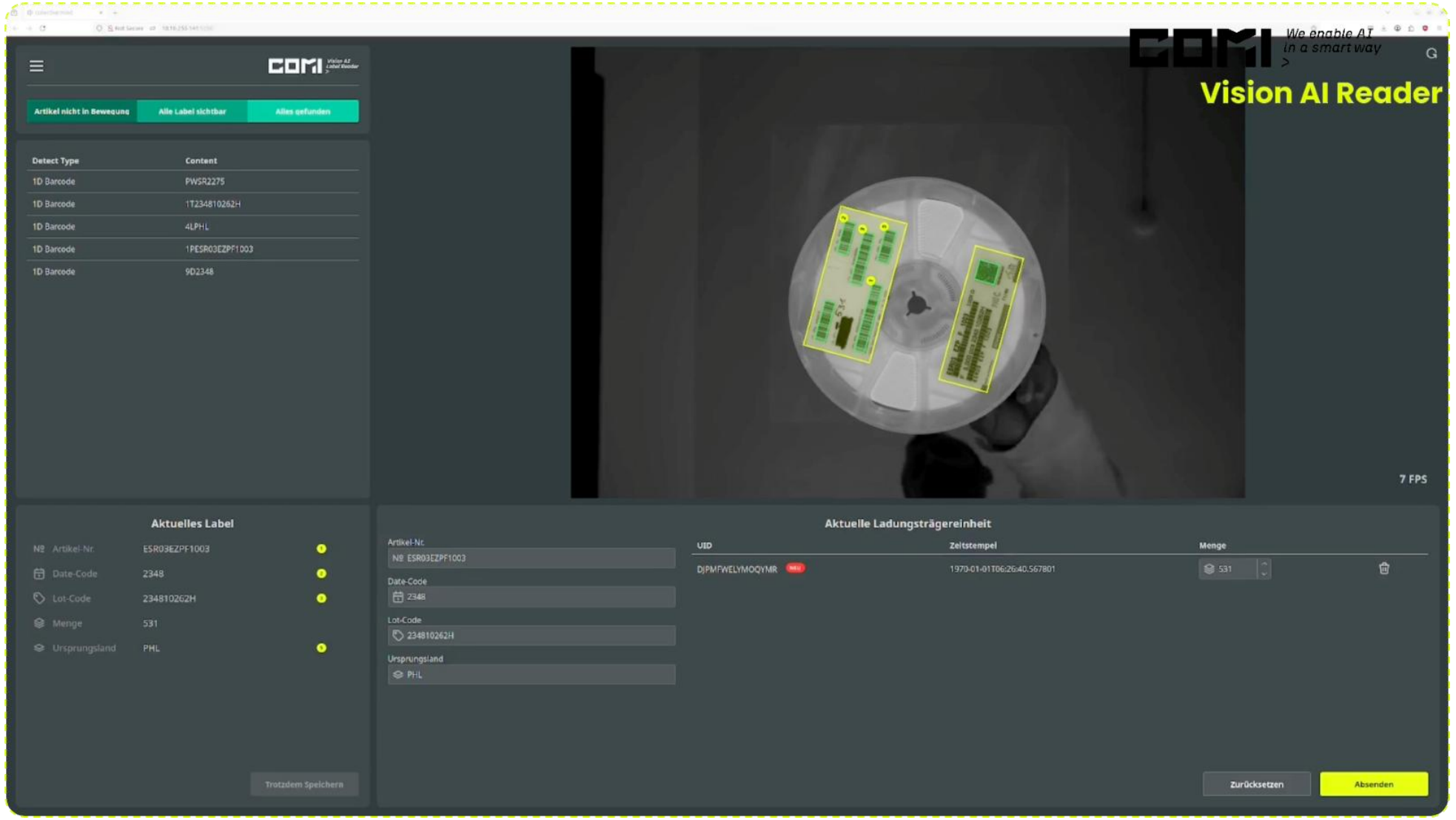

D&E event

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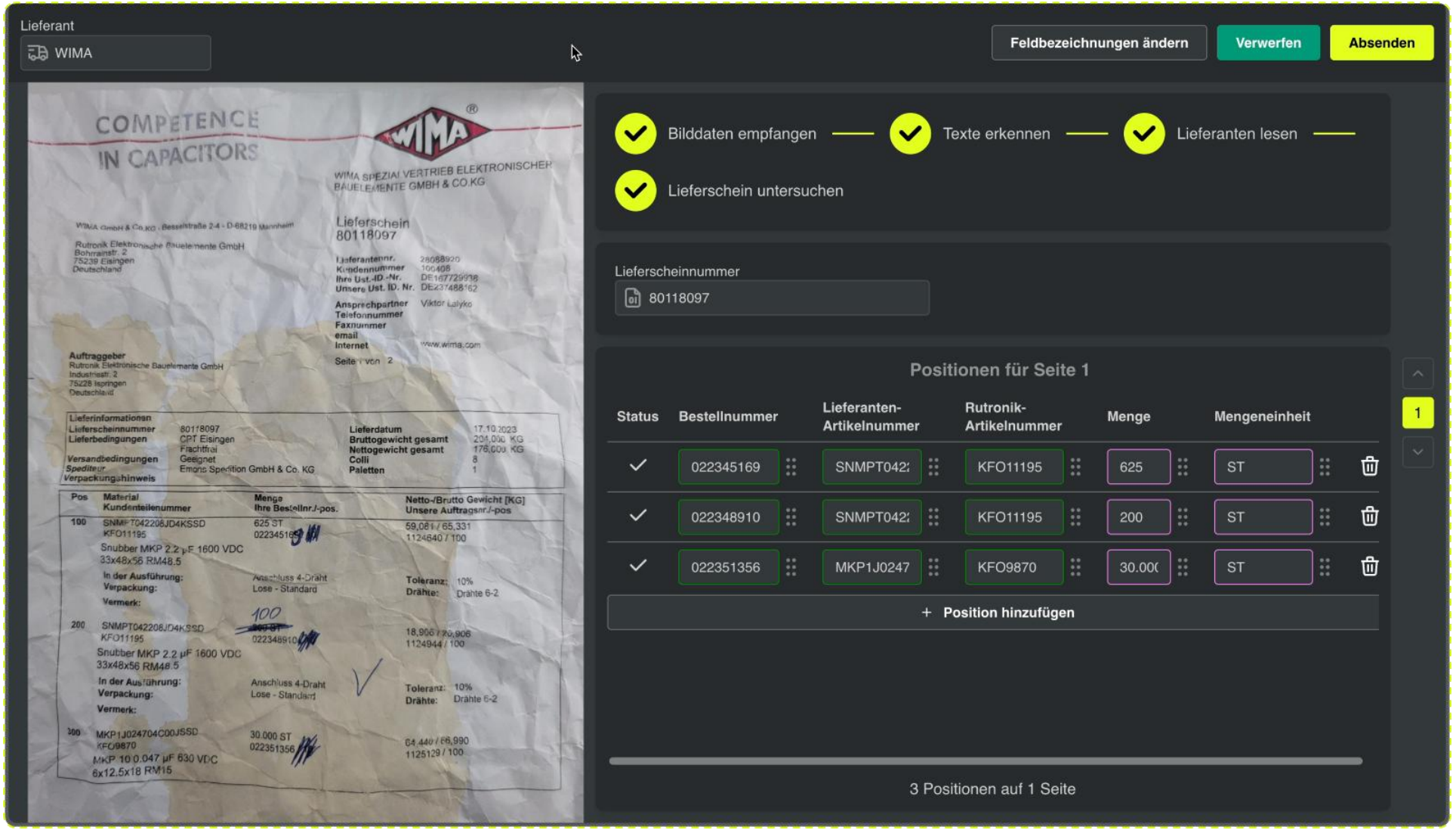

D&E event

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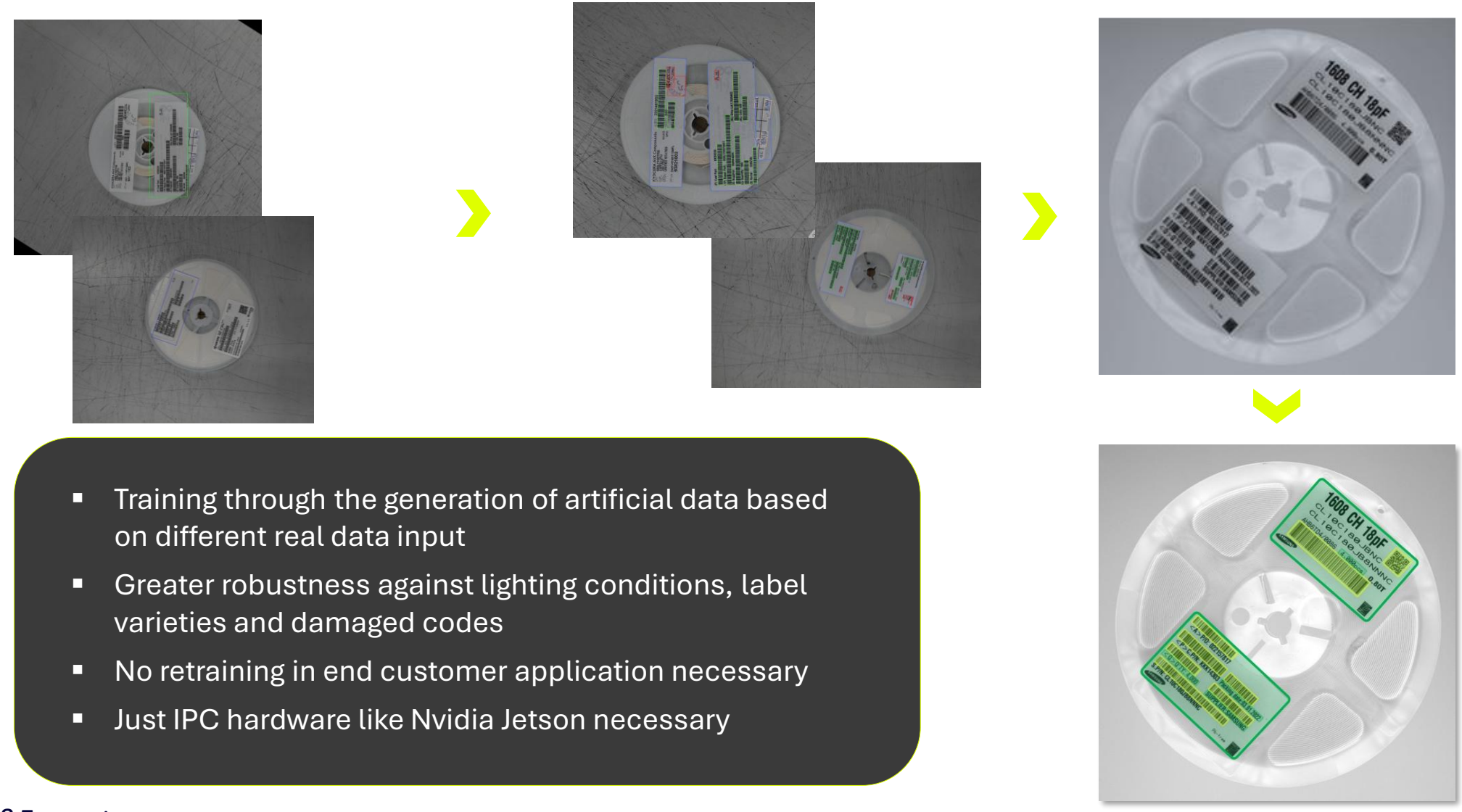

- Training through the generation of artificial data based on different real data input
- Greater robustness against lighting conditions, label varieties and damaged codes
- No retraining in end customer application necessary
- Just IPC hardware like Nvidia Jetson necessary

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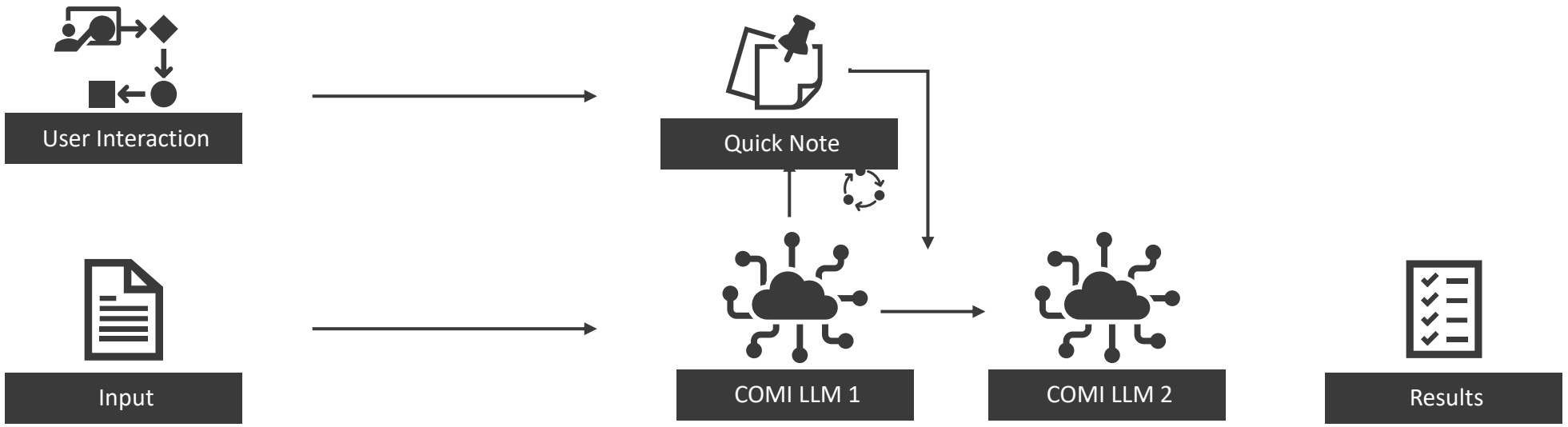

- Use of multiple LLMs for robustness against diverse layouts, languages and different conditions
- Continues learning through Quick Notes during user interaction

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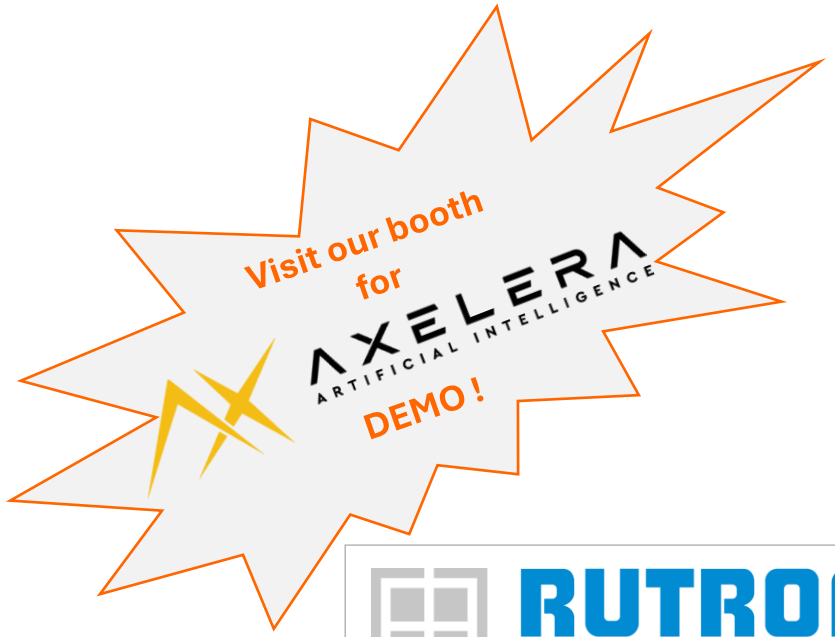
Questions ?



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